Where Tomorrow's Fuel Awaits Man's Effort

By EARL CHRISTMAS

THE great continental ice sheet, invading North America, left thousands of lakes in its path, sprinkled over the northern states from Minnesota to Maine. In Minnesota alone, there are 10,000 lakes and more, which are helping to make the North a great summer playground.

But the interrupted drainage of the glaciated region gave these states another priceless asset. When great fields of ice covered the ground thousands of years ago, nature was providing, by a curious paradox, a way for future generations to keep warm.

Peat, deposited in these lakes and marshes in quantities sufficient to make billions of tons of fuel, has been the beneficent gift of the ice sheet to Wisconsin, Minnesota, Michigan, New York and the New England states.

In the peat bogs, scattered over nine states and parts of a dozen others, there lies one of the great undeveloped resources of the nation, now beginning to attract serious attention with the appreciable diminishing of the available coal supply of the country. Only recently have we come to realize the immensity of these deposits, now apparently approaching development as a fuel.

In the state of Minnesota alone, there are 5,217,000 acres of workable peat with a potential supply of 6,835,000,000 tons of dry peat available for fuel, according to an extensive survey of the state completed recently by the University of Minnesota and the Minnesota Geological Survey under the direction of Professor E. K. Soper. Almost seven billion tons of peat—think of it! All the money in circulation in the United States wouldn't buy half of it, if it were all prepared for fuel and delivered to the door of the consumer. Selling at only $3 a ton, its value would exceed the deposits in all the national banks.

Of such proportions is this resource in one state. Other states likewise have vast quantities. F. W. Huels estimated that there are 3,000,000 tons of dry peat in Wisconsin. Michigan also has extensive deposits. According to the United States Bureau of Mines, workable beds of peat are common also through New York, the New England states and the northern sections of Iowa, Illinois, Indiana, Ohio and Pennsylvania.

Merchantable beds are common, too, through Florida, and occur in a narrow strip along the Atlantic and Gulf coasts.

The late Charles A. Davis, of the United States Bureau of Mines, estimated that the total quantity of machine peat available in the United States is approximately 12,888,000,000 tons. That's a staggering total when you try to comprehend it. As long ago as 1911 Dr. Davis put its value at $38,665,700,000, provided it sold at $3 a ton, and the probable value has increased since that time. It would furnish heat and power for the entire country for many years.

But the burning of peat has an individual as well as a national significance. For instance, consider this from Peter Christianson, professor of metallurgy in the School of Mines at the University of Minnesota:

"There is scarcely a farmer in the state of Minnesota, except in the southeastern, western and extreme northwestern portions, who could not make himself independent of a coal supply for heating purposes by preparing and using peat from his own farm. Incidentally, peat is found in 64 of the 86 counties of the state. Other states have lots of it too.

"All the man needs to do is to take a spade, cut the peat from his bog in blocks and dry it. He can do it cheaper than he can pay $15 or $20 for coal, too. My father burned peat for years here in Minnesota, and it made an excellent fire. Farmers are using it for fuel in some sections of the state, particularly those from the old countries who are acquainted with its use.

"Use of peat as a commercial fuel on a large scale is just as practicable. It's simply a problem in mechanical engineering, and processes are being perfected that will make it possible to produce a satisfactory fuel for many purposes at a price much cheaper than coal.

"Peat, properly prepared, is fully two-thirds as effective as the same quantity of ordinary bituminous coal. And it would cost much less. It seems a shame for these northern states to pay enormous sums for coal, and be dependent during long winters upon an often uncertain supply, when here at our very gates are these vast resources.

"All that is needed is initiative to start the enterprise on a large scale. In a few years, I am confident, peat will be utilized by many industries.

"One of the greatest possibilities in these almost unlimited fields, however, lies in the development of power. The time will come when these peat bogs, lying in many places like great, idle wastes, will be thriving centers of industry. Great power plants, located upon the beds, will transmit electric power to cities all over these states. By-products, worth millions of dollars, will pay for the great proportion of the cost of the power, and thousands of acres of land, now of little value, will be made fertile.

"That sounds like a dream, but it's coming as sure as day follows night. In fact, these very things are being done to some degree in other countries. Coal has been cheap in this country, and suitable machinery hasn't been developed for handling peat in the past. Now, however, considerable progress has been made in the development of machinery, and with the diminishing of our coal supply attention is turning more and more to peat."

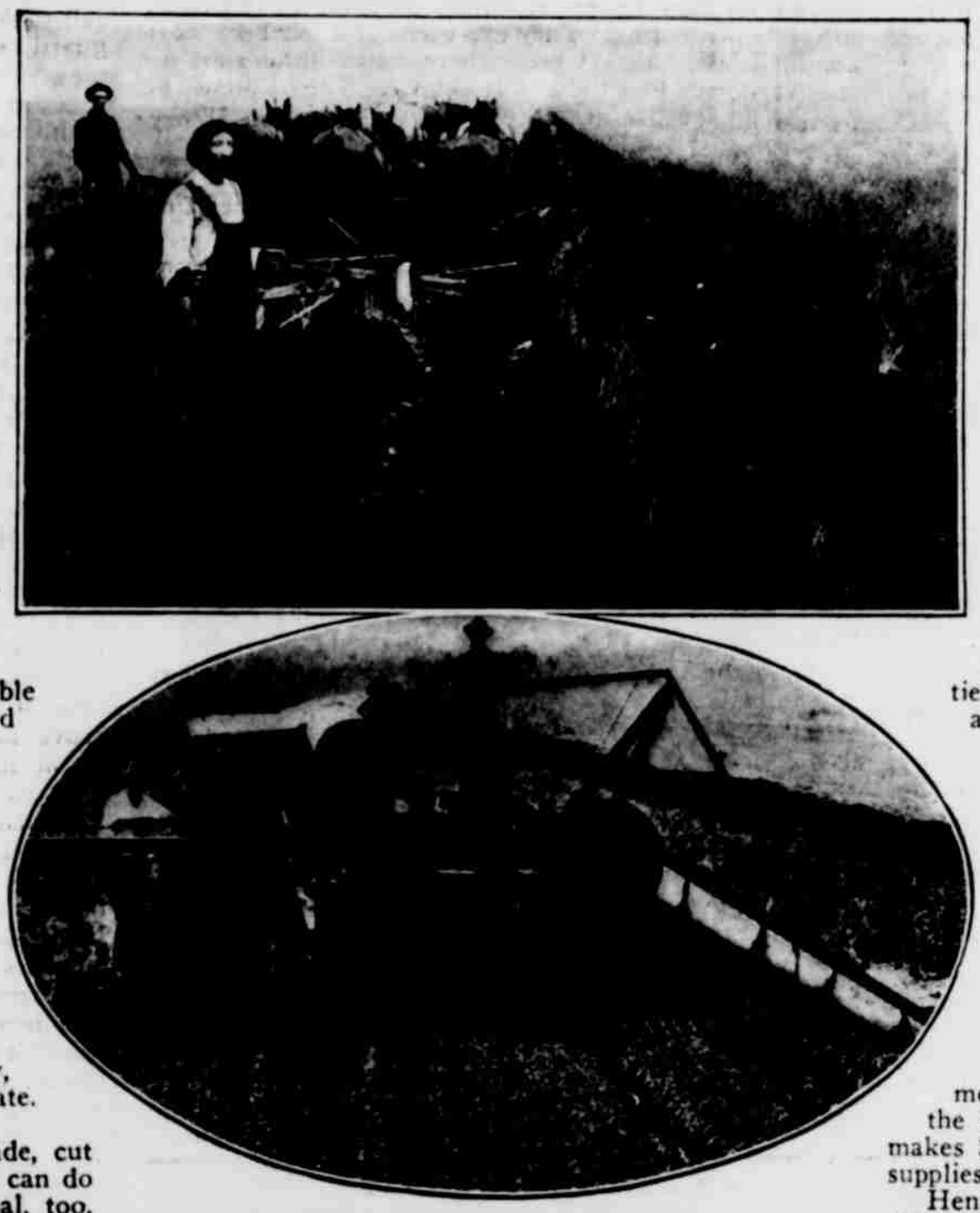
Use of peat as fuel dates back almost to the dawn of history. The Latin authors, commenting on the condition of peoples to the north, related how they dug the soil from the marshes with their hands, and after drying it burned it to warm themselves and cook their food.

In Ireland, peat has been the only domestic fuel for the mass of the people from the traditional time when the island was de-forested. In fact, the peat fire on the hearth is an essential element of Irish national life.

Turf cut from the bog still is the only fuel over a wide portion of Northern Europe. It is cut into bricks with a spade made for the purpose, and laid out to dry, being stacked in sheds for the winter. It makes a splendid fire in an open fireplace or an ordinary stove if there is a good draught.

Machines for handling peat have been in use in Europe for many years, though only recently have they approached any great degree of commercial success. Development of the industry in some of the European countries has been aided by government appropriations and experimental work. In Sweden, particularly, has considerable progress been made. Powdered peat has been burned successfully as locomotive fuel there, comparing favorably with coal, and the government has erected several large peat-powder plants. Preparation of peat for fuel as a commercial enterprise also has been developed in Canada to some extent.

From 15,000,000 to 20,000,000 tons of peat fuel are used annually in European countries, according to the United States Bureau of Mines.



Top—Farmers in Cass County, Minnesota engaged in the preparation of fuel for the winter by the use of an ordinary plow. The strips can be cut into blocks of convenient size.

Bottom—This picture shows the rear of a new peat machine, illustrating how knives on the spreader cut the sheet of pasty peat into strips. Later they are crosscut into briquettes by another device. The peat is carried through the pipe at the side, macerated, and spread into the layers shown in the foreground.

Here in the United States, however, few people have any very definite idea of the value of peat as fuel. Most of us know that peat is an accumulation of vegetable matter, which has been partially preserved from decomposition by immersion in water. Most of us, too, have known that peat will burn—if it is dry.

Firemen in the northern states have been called out of the cities on occasion to put out peat fires. There have been instances, too, of roads burning up in a manner seemingly miraculous to the uninitiated, when they happened to run across peat lands, and there have been disastrous peat fires frequently in regions where marshes have been drained. For days these beds will burn, the fires extending often beneath the surface.

But few have realized that peat might replace coal and break to a large extent the dependence of some of the northern states upon distant coal mines.

For several months, a Minneapolis company has been engaged in the preparation of peat for fuel, said to be the only enterprise of its kind in the country. A machine has been perfected that digs, macerates and spreads out to dry 700 tons of wet peat in a day, or a quantity sufficient to produce 100 tons of dry fuel. That's how much peat contracts in the drying process. One man operates the machine.

During last summer, the machine was operated on a bog near Minneapolis, and peat, processed at the University of Minnesota, was burned with satisfactory results in a Minneapolis office building.

A crusher plant, with a capacity of 500 tons of peat a day, has been built in Minneapolis during the winter to produce powdered peat, and in the spring ten peat digging machines are to be started to work on the Minnesota bogs.

Peat machines of many types have been developed, but the machine in use in Minnesota, perfected by Herbert Garnett after twenty-five years of work, is perhaps the most effective type, according to Professor Christianson.

The great problem to be overcome in the preparation of peat for fuel is the removal of its water content, which runs as high as 80 and 90 per cent in the natural state. Draining of the bog removes part of the water, but the greater proportion must be removed by air drying. It requires about 90 days to reduce it to 20 per cent moisture, when it is ready for fuel. This involves considerable time, but no satisfactory method has been found to force the water from the peat artificially.

The Garnett machine digs to a depth of seven feet. The digging unit consists of a worm that mixes the different layers of peat together, passing it in a pasty mass to a conveyor, where it is further macerated. The pulped mass then is discharged on the ground at the rear of the machine in a sheet four inches thick and 16 feet wide.

Knives on the spreader cut the sheet into thin strips, and later another device crosscuts it into briquettes. After drying for several weeks, the peat is put into windrows for further drying. If it is to be used as a hand-fired fuel, the dry blocks are run through a crusher and delivered to the consumer the same as crushed coke. The cost of fuel prepared in this way will be about $2.25 at the swamp, according to Mr. Garnett.

Pulverized peat makes better fuel, however. In this case, the peat is run through a coarse grinder, a dryer, then a pulverizer and delivered to customers in tank cars and burned the same as powdered coal. Pulverized peat can be delivered to the boiler for less than $5 a ton, according to Mr. Garnett, who declares using peat will reduce the fuel bills of local industries fully 50 per cent.

Engineers conducting the tests at the Minneapolis office building burning peat said that a pound of the powdered coal used evaporated 9.9 pounds of water, a pound of pulverized peat 9 pounds, and a pound of coal hand-fired in the usual way from 5 to 6 1-2 pounds. The peat powder, fed into the furnace, under air pressure, burns almost like gas and with little smoke. Good peat fuel has an ash content not to exceed 15 per cent.

Effectiveness of peat, as compared with coal, varies, however, under different circumstances, and according to different authorities. Soper says that the heating value of the average peat is slightly more than .6 that of the heating value of the ordinary bituminous coal, while the best peat is about 75 per cent of the heating value of anthracite, and 80 per cent of the heating value of Illinois coal. The average thermal value of the better Minnesota peats runs from 9,000 to 10,000 British thermal units for moisture-free peat, he found.

Captain Ernst Wallagren, chief peat engineer for the Swedish Government, found, according to a recent Bureau of Mines bulletin:

"The peat powder when burned by the method used by Back was equal in fuel value to the best English coal, ton for ton. This discovery makes Sweden independent of other countries for fuel supplies for industrial uses."

Henry J. Hindshaw, engineer in the mineral lands department of the state of Minnesota, pointed out that powdered peat under some circumstances might be more effective than coal.

Government engineers have estimated the cost of producing peat fuel from $2 to $3 a ton. The machine peat, air dryed, is the cheapest. Compressed into briquettes, it is somewhat more desirable for domestic use, and slightly more expensive. Peat powder can be produced and delivered at less than $5 a ton, according to Mr. Garnett. From $3 to $5, then, would seem to be the consensus of opinion as to its cost.

There are varied possibilities in the use of peat. Very fine cloths have been made from the fiber in England. Coarse cloths and blankets have been made from it in Sweden. Paper has been made from it in the United States. Gas, charcoal, coke and a number of valuable by-products are produced from it.

Peat powder and fiber have been used in dressing wounds. Hundreds of thousands of surgical dressings were made from peat moss, or sphagnum, during the war. Sphagnum has many advantages over cotton for this purpose. Peat has exceptional antiseptic, absorbent and de-odorizing qualities.

Peat is used extensively as a filler for fertilizer. It may be briquetted with iron ores. There are millions of tons of fine dust not usable in the blast furnaces. Briquetted with peat, much of this can be used, Professor Christianson has found in an interesting series of experiments. A substitute for lumber, harder and tougher than wood, has been made by the mixture of peat and plaster of Paris.

Producer gas plants for generating heat and power offer perhaps the most effective way of utilizing peat, according to Professor Christianson. By-products, of which ammonium sulphate is the chief, would bring in vast sums. The ammonium sulphate from the by-product plant at Orentano, Italy, as long ago as 1913, paid for two-thirds of the cost of operation, and the demand for ammonium sulphate for fertilizer has increased greatly since that time.

So, all in all, we may find considerable recompense in the prehistoric visit of the glaciers.